

Entomological Survey of Himalaya

Part XXVI. A Contribution to our Knowledge of the Geography of the High Altitude Insects of the Nival Zones from the North-West Himalaya¹

PART 1

BY

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(With eleven text-figures)

I. INTRODUCTION

The zoogeographical considerations of the nival insect fauna from the north-west Himalaya, outlined here, are based on our four years' work in the School of Entomology, St. John's College, Agra. The nival insects belong to an ecologically specialized, cold-adapted, mountain-autochthone fauna, inhabiting the montane tundra beyond the timber line (Fig. 1), above an elevation of 3000 metres and extending to over 6000 metres above m.s.l. We have recently described the field ecology of these insects (100).

The earliest collections of the high altitude insects from the region were probably made by von Hügel (72). His collections, comprising several hundred species, were described by various specialists in Europe, like Kollar and Redtenbacher (80). The next important attempt at collecting in the region was undoubtedly by the Yarkand Political Mission. To Col. Stoliczka, the renowned geologist and naturalist of the Yarkand Mission, should really go the chief credit for discovering the wealth of insect life in these inaccessible and extremely inhospitable regions. His collections were described by various eminent European specialists (12, 13, 28, 107, 108, 125, 143). Guy Babault, the celebrated French naturalist, who travelled through Kangra, Kulu, and Lahaul valleys, through Ladakh and parts of Kashmir in 1914, brought back fairly large collections of high altitude species. The Orthoptera from his collections were identified by Uvarov (151). The large collection of Carabidae was described by Andrewes (2). The Curculionidae were worked out by Hustache (73) and the Histeridae by Desbordes (24). In recent years the Yale University North-India Expedition has also made valuable

¹ For parts I-XXIII see References Nos. 8-10, 51, 56, 77, 90-99, 101, 130-133, 136-140; part XXIV is appearing in *Proc. National Acad. Sciences, India*, and XXV in *Proc. Zool. Soc.*

collections of the high altitude insects, mainly from Ladakh (3, 21, 23, 74). Some collections of these insects were also made by the Italian Karakorum Expedition (14, 47, 48, 111) and by the German Nanga Parbat Expedition (34). A special study of the high altitude insects of the NW. Himalaya was initiated some years ago by the first author in

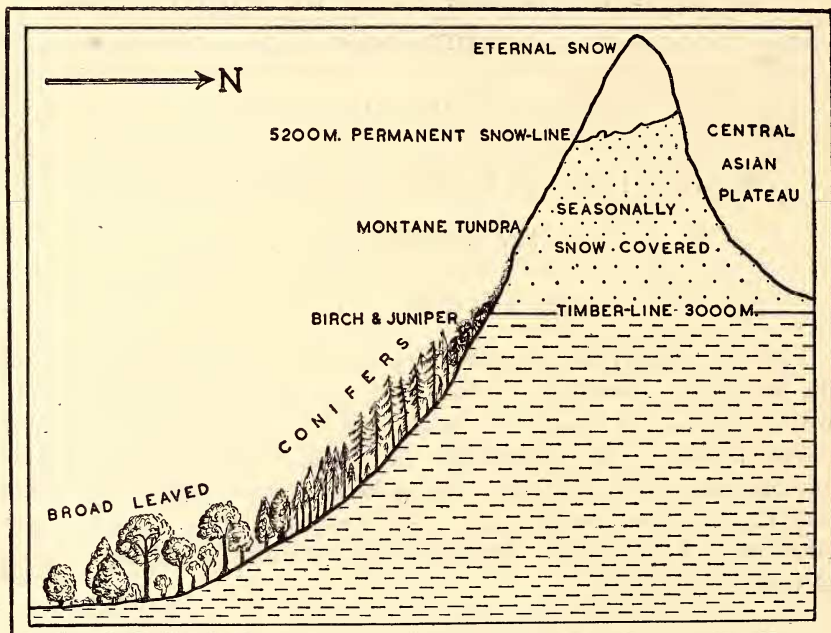


Fig. 1. A simplified diagram of the region of the north-west Himalaya, showing the zone of the montane tundra above an elevation of 3000 metres above mean sea level. This seasonally snow-covered zone is the home of the nival insect fauna. (Not drawn to scale).

the School of Entomology, St. John's College, Agra. The three entomological expeditions to the NW. Himalaya, organized and led by him, brought back over 15,000 specimens of large numbers of species of the nival insects. Some of the results of the work of the three expeditions have already been published (8, 9, 10, 51, 56, 77, 95-101, 130-140).

The localities from which the nival insects have so far been collected are listed below under the three natural drainage areas of the NW. Himalaya, viz. the Indus area, the Chenab-Beas area, and the Jhelum area (Fig. 2). In the following pages we have briefly discussed the known distribution of about 400 species so far found inhabiting the nival zones in the region. Although this represents a fraction of the total nival species still awaiting discovery, our account of the basic distributional patterns is not likely to be affected by future additions. The general pattern of distribution conforms to the known characters of high mountain fauna, but most of the peculiarities are more or less greatly

exaggerated in the case of the massive NW. Himalaya. Zoogeographical analysis shows a high degree of endemism and the great predominance of the Palaearctic faunal elements. Some of the limiting factors in the distribution of nival insects are briefly outlined. On the basis of the differences in the general species composition, the region is subdivided into three faunal provinces, which agree with the three natural drainage areas. The available evidence indicates mainly the Pliocene origin of endemism from an Angaran (central Asiatic) stock *pari passu* with the third major phase of the uplift of the NW. Himalaya and the Pleistocene survival of the nival species on nunataks. Some endemites have also risen during the Pleistocene and there are a few post-Pleistocene endemites also.

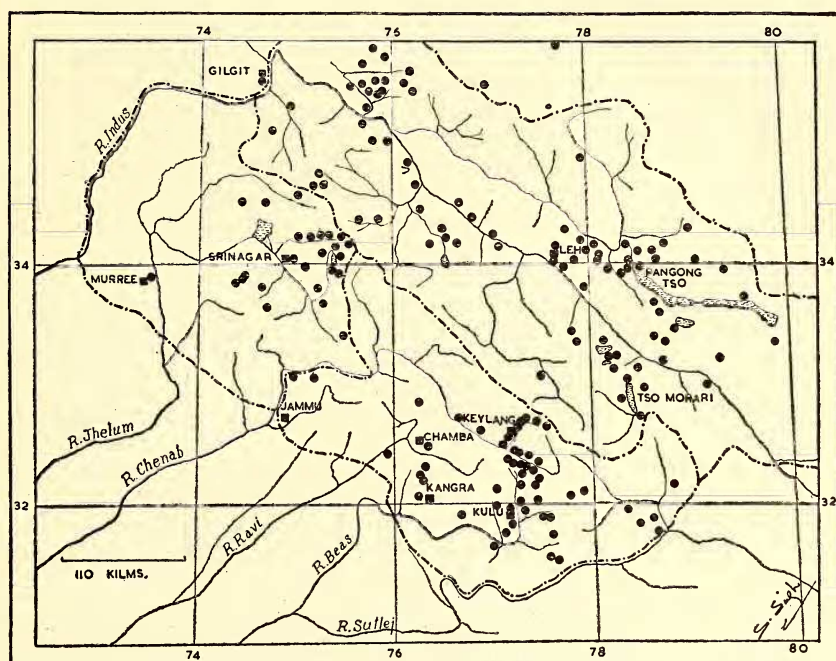


Fig. 2. Map of the region of the north-west Himalaya, showing the localities from which the nival insects have been collected so far.

ACKNOWLEDGEMENTS

We take this opportunity of expressing our cordial thanks to the members of the three entomological expeditions for their willing co-operation and team work. We are particularly indebted to the authorities of St. John's College, Agra, for facilities and encouragement. We are also grateful to the Agra University for part financial assistance for the expeditions. Our thanks are also due to various specialists for identification of the material. We are grateful to the authorities of the Carnegie Institution, Washington, U.S.A., for important literature.

LOCALITIES FROM WHICH NIVAL INSECTS HAVE BEEN COLLECTED

INDUS DRAINAGE AREA

1. Alchori .. Shigar Valley 75° 39' E., 35° 32' N.
2. Anem La .. Somewhat E. of NW. end of Pongong Tso, near 78° 45' E., 34° N.
3. Baltoro Glacier .. 76° 15' to 76° 30' E., 35° 45' N.
4. Bao and Shaple .. Near Shyok to NE. of Leh in Ladakh
5. Bardumul .. W. of Baltoro Glacier, 76° 1' E., 35° 38' N.
6. Biahio Valley .. Tributary of Shigar River flowing into Indus
7. Boorgi Nulla .. Tributary of R. Suru, S. of Skardu
8. Braldo Valley (including In Baltistan
Braldotal, Askole, Kro
Brok and Dusu)
9. Burzil Chauki .. In Deosi Plain, 75° 5' E., 34° 50' N.
10. Chang Chenmo .. Tributary of R. Shyok, N. of Pongong Tso
11. Chang La .. 77° 56' E., 34° 3' N. ; E. of Leh in Ladakh
12. Chhota Deosi .. Between R. Dras and Boorgi Nulla
13. Chongo Hot Spring .. In Braldo Valley, 75° 48' E., 35° 40' N.
14. Chusul .. S. of Pongong Tso, 78° 40' E., 33° 36' N.
15. Dakar .. On Tibetan border in Ladakh
16. Damb Guru .. Somewhat to N. of E. end of Pongong Tso 78° 54' E., 33° 58' N.
17. Daulad Begoldi .. SE. of Karakorum Pass
18. Deosi (Lalpani) .. In R. Dras drainage area
19. Digar Polu .. On S. slope of Ladakh Range ; NE. of Leh
20. Doyan .. Near Nanga Parbat on R. Astor, on route to Gilgit ; 74° 48' E., 35° 30' N.
21. Dumiltar .. Glacier, E. of Punmah Valley and N. of Braldo Valley
22. Dras .. Between Zojila Pass and Kargil, on road to Leh in Ladakh ; 75° 45' E., 34° 25' N.
23. Ghulam Bagh .. Near Chushod (also called Shushot), on left bank of R. Indus in Ladakh ; 77° 44' E. and somewhat north of 34° N.
24. Gilgit .. 74° 18' E., 35° 58' N.
25. Igu .. Right bank of R. Indus above Leh in Ladakh
26. Kangral .. About 13 km. E. of Mulbek
27. Karbu .. Near Mulbek in Indus Valley, Ladakh
28. Kardong Pass .. N. of Leh on Ladakh Range
29. Kargil .. On the left bank of R. Suru on road to Leh from Srinagar, in Ladakh
30. Karpet .. On S. shore of Pongong Tso, in Ladakh
31. Kastet La .. Between Mitpal Tso and Yaye Tso, in Ladakh ; 78° 32' E., 33° 23' N.
32. Kayann La .. In Koh Lungpa Valley, between Leh and Shyok, Ladakh
33. Khalatse .. Between Kargil and Leh, right bank of R. Indus, Ladakh ; 76° 53' E., 35° 36' N.
34. Kushumul .. Shigar Valley, 75° 35' E., 35° 36' N.
35. Kutie Pass .. N. of Karakorum Pass

36. Kyam La and Kyam Hot Near E. of R. Chang Chenmo, N. of Tso Pongong Spring
37. Kyang La .. SE. of the confluence of R. Chang Chenmo and R. Shyok, in Ladakh ; 78° 25' E., 34° 9' N.
38. Kro Brok .. Braldo Valley, about 8 km. E. of Chongo Hot Spring
39. Lac Sale (Salt Lake), also NW. of Tso Morari in Rupshu
 called Tso Kar.
40. Leh .. Capital of Ladakh on the right bank of R. Indus
41. Lopsang Bransa .. N. of the Baltoro Glacier ; 76° 18' E., 35° 48' N.
42. Lukung .. Somewhat N. of NW. end of Pongong Tso ; 78° 23' E., 34° N.
43. Marsimik La .. N. of NW. end of Pongong Tso ; 78° 40' E., 34° 12' N.
44. Matyan .. On road between Zojila Pass and Dras in Ladakh
45. Mitpal Tso .. S. of Pongong Tso, between Pangur Tso and Yaye Tso
46. Mulbek .. In Ladakh, 76° 25' E., 34° 25' N.
47. Mundu .. Mundu Glacier, S. of the Baltoro Glacier, near 76° 15' E., 35° 45' N.
48. Mustag .. N. of the Baltoro Glacier ; 76° 15' E., 35° 50' N.
49. Nanga Parbat area, including Partabgarh and Chamura (German Nanga Parbat.
 Expedition Collections)
50. Nima Mud .. On the right bank of R. Indus, below S. end of Pongong Tso in Ladakh
51. Nurla .. E. of Khalatse on the right bank of R. Indus ; 76° E., 35° 18' N.
52. Nyangtsu .. Between Chang Chenmo and Pongong Tso ; 78° 50' E., 34° 2' N.
53. Nyangri .. 78° 50' E., 34° 2' N.
54. Olthingthang .. Indus Valley, left bank of Suru tributary of R. Indus and near its confluence with the latter
55. Ororotse Tso .. S. of the confluence of Chang Chenmo and Shyok, in Ladakh ; 78° 28' E., 34° 15' N.
56. Pango .. Near to and somewhat W. of Mulbek in Ladakh
57. Pongong Valley .. NW. of Pongong Tso
58. Parkutta .. Indus Valley, E. of Skardu ; 75° 55' E., 35° 5' N.
59. Peldo La .. N. end of Tso Morari
60. Phuga Hot Spring .. N. end of Tso Morari ; 78° 20' E., 33° 12' N.
61. Punmah Valley .. Includes many localities like Shimtsa, Punmah Tal, Skiniltolmosa, Tsok, etc., N. of Braldo Valley
62. Renka La .. Between Mitpal Tso and Yaye Tso, S. of Pongong Tso.
63. Saser La .. Above Shyok, between and nearer to 78° than 77° E.
64. Shaksgan Valley .. N. of Karakorum Range
65. Shakya La .. Near Shyok, W. of Bao and to the N. of E. of Leh
66. Shergol .. About 8 km. W. of Mulbek
67. Shera La .. 77° 88' E., and 33° 55' N.
68. Shigar Valley .. Opposite Skardu in Baltistan

69. Shimsha .. Suru Basin near Kargil
70. Skardu .. Indus Valley
71. Skoro La .. Baltistan, 75° 48' E., 35° 33' N.
72. Slope opposite Mulbe Gumpa in Ladakh
73. Spitok (Pitok) .. Right bank of R. Indus and S. of Leh
74. Spring below Fotu La .. E. of Mulbek
75. Sta-rtsk-puk-Tso .. SE. Tso Kar.
76. Suru Basin .. Indus drainage area
77. Tagalang La .. 77° 45' E., 33° 30' N.
78. Tangyar .. NE. of Leh and S. of R. Shyok ; 77° 52' E., 34° 15' N.
79. Tankse to Chagra .. On R. Tankse, a feeder of R. Shyok, near Shyok ; 78° 10' E., 34° 2' N. and Chagra 78° 28' E., 34° 5' N.
80. Tankse to Mugleb .. About 10 km. E. of Tankse
81. Thla Brok .. Left bank of Braldo stream, 75° 52' E., 35° 38' N.
82. Thangman Tso .. East Ladakh
83. Tograma Tso .. Near Padam, 76° 52' E., 33° 28' N.
84. Tolti .. E. of Parkutta, 76° 5' E., 34° 2' N.
85. Tsak-shang and Tsak-ra .. On road from Tso Morari to Tso Kar in Rupshu
86. Tso Morari .. In Rupshu ; 78° 10' E., 32° 30' N.
87. Tso Nyak .. E. of Pongong Tso
88. Urdukas .. Near Baltoro Glacier ; 76° 17' E., 35° 45' N.
89. Widukas .. In Braldo Valley
90. Zarra .. S. of Tagalang La ; 77° 40' E., 33° 15' N.
91. Zaskar .. N. of main crest line of the Great Himalaya.

CHENAB-BEAS DRAINAGE AREA

1. Baijnath .. On road from Palampur to Jogendranagar on Dhauladhar Range, S. slope ; 76° 38' E., 32° 2' N.
2. Bahaura .. On right bank of R. Beas near and S. of Kulu (Sultanpur)
3. Baralacha La .. On Great Himalaya, main pass connecting Lahaul with Ladakh, with sources of Chandra on S. and Bhaga on N. ; 77° 27' E., 32° 45' N.
4. Batote .. On road from Jammu to Srinagar, S. of Banihal Pass ; 76° 15' E., 33° 2' N.
5. Bhabu Pass .. W. of Sultanpur (Kulu)
6. Chamba .. Upper R. Ravi Valley on N. slope of Dhauladhar Range
7. Chhatru .. Chandra Valley (Lahaul), opposite Hamta Gorge ; 77° 23' E., 32° 20' N.
8. Cimur .. Bhaga Valley (Lahaul) ; 77° 23' E., 32° 20' N.
9. Dalhousie .. On Dhauladhar Range ; 76° 8' E., 32° 15' N., in Gurdaspur Dt., Punjab
10. Dharamsala .. Kangra Dt., Punjab, on Dhauladhar Range ; 76° 20' E., 32° 13' N.
11. Dhauladhar .. N. of Dharamsala
12. Dhorni .. Upper Chandra Valley (Lahaul), between Koksar and Chhatru ; 77° 18' E., 32° 22' N.

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| 13. | Dibi Bokri and Runi Tach | .. | In Spiti Valley |
| 14. | Gharri | .. | Parbati Valley (Punjab) |
| 15. | Gondhla | .. | Upper Chandra Valley (Lahaul), on road from Koksar to Keylang ; 77° 2' E., 32° 30' N. |
| 16. | Gramphu | .. | Upper Chandra Valley (Lahaul), below Rohtang Pass and in front of Kulti Nal ; 77° 15' E., 32° 23' N. |
| 17. | Hamta Gorge | .. | Upper Chandra Valley (Lahaul) after descent from Hamta Pass and E. of Chhatru, on Pir Panjal Range |
| 18. | Hamta Jot and Hamta Pass | | Pir Panjal Range, on Manali-Kanzam La route, 77° 21' E., 32° 17' N. |
| 19. | Jalori Pass | .. | On route from Simla to Kulu, about 36 km. from the junction of Manali-Kulu road and Simla-Kulu road at Aut |
| 20. | Jibhi | .. | 6 km. from Jalori Pass toward Kulu |
| 21. | Kandi | .. | NE. of Mandi (a pass on way to Kulu) |
| 22. | Kangra | .. | Headquarters of Kangra District, Punjab (Kangra Valley) |
| 23. | Kareri Lake | .. | N. of Dharamsala on the S. slope of Dhauladhar Range |
| 24. | Keylang | .. | Capital of Lahaul Valley on R. Bhaga ; 77° 2' E., 32° 35' N. |
| 25. | Khoksar | .. | Upper Chandra Valley (Lahaul), below Rohtang Pass on road to Keylang |
| 26. | Kote | .. | Upper Beas Valley, on road from Manali to Rohtang Pass ; 77° 13' E., 32° 20' N. |
| 27. | Kulti Nal | .. | Chandra Valley (Lahaul), on Great Himalaya Range, N. slope, opposite Rohtang Pass, site of a large Pleistocene Valley Glacier, with the present Kulti Ice Fall or Seragru Ice Fall |
| 28. | Laka Pass | .. | On Dhauladhar Range N. of and above Dharamsala ; 76° 23' E., 32° 18' N., on road to Chamba |
| 29. | Mandi | .. | On left bank of R. Beas on way to Kulu from Kangra |
| 30. | Manikaran | .. | Parbati Valley (Kulu Division), Hot Spring ; 77° 22' E., 32° 2' N. |
| 31. | Marhi | .. | Below Rohtang Pass on Pir Panjal |
| 32. | Naggar | .. | Beas Valley N. of Kulu on way to Manali |
| 33. | Namu | .. | On S. slope of Great Himalaya, in Upper Chenab Valley, below Baihali Jot Peak and near Triloknath ; 76° 53' E., 32° 45' N. |
| 34. | Nilang Pass | .. | Spiti |
| 35. | Pangi | .. | Sutlej Valley, N. of Chini on Hindustan Tibet road ; 78° 16' E., 31° 36' N. |
| 36. | Parbati Valley | .. | In Kulu Division, Punjab |
| 37. | Patseo | .. | Bhaga Valley (Lahaul) ; 77° 15' E., 32° 45' N. |
| 38. | Peak W. of Rohtang Pass
(Beas Rikhi Peak) | .. | 77° 14' E., 32° 22' N. |
| 39. | Pir Panjal Range opposite Kulti Nal | | |
| 40. | Pulga | .. | At the end of the Parbati Valley |

41. Purana Khoksar Nal .. In Great Himalaya, above Chhatru, Upper Chandra Valley, with Sonapani Glacier and Seri Ice Fall
42. Ramban .. River Chenab on way to Srinagar from Jammu.
43. Rahla .. Upper Beas Valley below Rohtang Pass; 77° 12' E., 32° 20' N.
44. Rohtang Pass .. On Pir Panjal Range on way to Lahaul and Keylang from Manali; 77° 15' E., 32° 23' N.
45. Runang and Hungrung Pass In Spiti drainage area
46. Rohtang Valley .. Upper Beas Valley; source of R. Beas; on the S. slope of Pir Panjal Range
47. Seraj .. Kulu area N. of Larji
48. Sidu .. Chandra Valley (Lahaul); 77° 8' E., 32° 22' N.
49. Solang Valley .. W. of Manali in Kulu Valley
50. Sumdeo .. Bhaga Valley (Lahaul); 77° 13' E., and 32° 40' N.
51. Tandi .. At the confluence of Bhaga and Chandra, in Lahaul Valley; 76° 58' E., 32° 34' N.
52. Taulin Pass to Shipki Pass .. In Spiti drainage area
53. Tchary-Joni .. End of the Parbati Valley in Kulu Division of Punjab.
54. Thiroat .. Upper Chenab Valley; 76° 47' E., 32° 39' N.
55. Tsho-Ti .. End of Parbati Valley
56. Zingzingbar .. Bhaga Valley (Lahaul); 77° 20' E., 32° 48' N.

JHELUM DRAINAGE AREA

1. Apharwat .. S. of Khilanmarg, on Pir Panjal Range (Kashmir)
2. Baltal .. Near and somewhat E. of Sonemarg in the Sind Valley (Kashmir)
3. Gagarbal .. Between Kangan and Sonemarg in the Sind Valley
4. Gond .. Sind Valley; 75° 5' E., 34° 18' N.
5. Goorai Valley .. N. of Tragbal Pass (Kashmir)
6. Gulmarg .. Kashmir, 74° 55' E., 34° N.
7. Kangan .. Sind Valley; 74° 55' E., 34° 18' N.
8. Khilanmarg .. On Pir Panjal Range near Gulmarg, Kashmir, approximately about 74° 25' E., 34° N.
9. Kolahoi Glacier .. Kashmir; 75° 25' E., 34° 10' N.
10. Lake Vishnushar .. Near and N. of Avantipur, Kashmir, on route to Srinagar
11. Liddar Valley .. Kashmir, Liddar tributary of R. Jhelum
12. Liddarwar .. S. of Kolahoi Glacier
13. Prang .. Sind Valley, near Sonemarg
14. Razdhingan .. Near Sonemarg
15. Sintan Pass .. E. of Verinag; 75° 35' E., 33° 30' N.
16. Sonemarg .. 75° 18' E., 34° 20' N.
17. Songam .. Sind Valley
18. Srinagar .. Kashmir Valley; 74° 35' E., 34° 2' N.
19. Tragbal Pass .. 74° 40' E., 34° 30' N.
20. Yusimarg .. E. of Gulmarg on S. slope of Pir Panjal Range
21. Zoji La .. On road to Leh from Srinagar; 75° 30' E., 34° 20' N.

II. THE NIVAL INSECT FAUNA

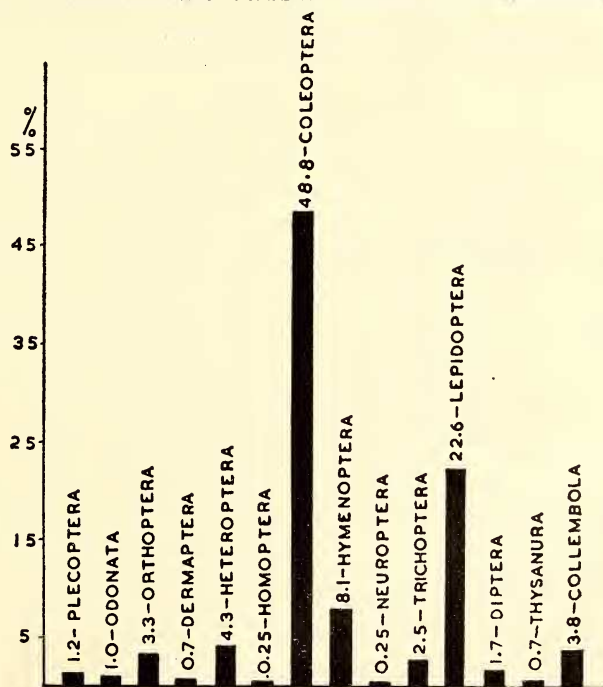
Nearly 400 species, belonging to 14 orders, occur above an elevation of 3000 metres. The number of species and their percentage abundance in different orders are summarized in Table I (Fig. 3).

TABLE I

Analysis of abundance of species of different Orders of the nival insect fauna

Serial No.	Order	Number of species	Percentage
1.	Plecoptera	5	1.27
2.	Odonata	4	1.01
3.	Orthoptera	14	3.30
4.	Dermaptera	3	0.76
5.	Heteroptera	17	4.50
6.	Homoptera	1	0.25
7.	Coleoptera	186	48.80
8.	Hymenoptera	36	8.10
9.	Neuroptera	1	0.25
10.	Trichoptera	11	2.50
11.	Lepidoptera	91	22.60
12.	Diptera	7	1.70
13.	Thysanura	3	0.76
14.	Collembola	15	3.80

Total number of nival species = 394



[Fig. 3. The total nival insects from the north-west Himalaya.

About half the known nival species belong to Coleoptera and nearly one-fourth to Lepidoptera. Though the Diptera, so far described from the region, seem to constitute less than 2.0% of the total nival insects, the order is however extremely abundant, especially at extreme high altitudes. Recent experience of the three entomological expeditions (100) has shown that no less than 300 undescribed species exist above the timber line. Diptera should eventually surpass Coleoptera and prove to be the most abundant of nival insects. Except Collembola, the remaining orders represent minor taxonomic elements of the nival insect fauna.

The distribution and zoogeographical analysis of the different orders of nival insects are discussed below.

PLECOPTERA

Although several species of stoneflies are widely distributed, often at great elevations and close to the permanent snow line (100), throughout the NW. Himalaya, a relatively small number of species has so far been identified and described. Among the species listed below endemism is high, viz. 80%. They are localized in the drainage area of the Chenab-Beas system. The species belong to well-known Holarctic genera of Tertiary origin. We do not at present know anything about the Plecoptera of the mountain ranges drained by the Indus.

Nemouridae

- *1. *Capnia manii* Jewett
Localities : Beas Valley, near Marhi 3352 m., Marhi 3657 m.
- *2. *Nemoura (Nemoura) cordata* Jewett
Localities : Gramphu 3352 m., Chandra Valley 3352-3657 m.
- *3. *Nemoura (Nemoura) punctata* Jewett
Localities : Gramphu 3657 m., Beas Valley near Marhi 3352 m.
- *4. *Nemoura (Nemoura) punjabensis* Jewett
Localities : Chhatru 3352-3657 m., Rahla 2743 m., in Beas 3.5 km. below Rahla 3048-3352 m., Kulti Nal 3535 m., Gramphu 3657 m., Dhorni 3657 m., Pir Panjal Range opposite Kulti Nal 3657 m., Rohtang Pass 3962 m.
5. *Rhabdiopteryz lunata* Kimmins
Localities : Kulti Nal 3535 m., Chhatru 3500 m., Hamta Jot 4420 m., Kulu Valley.
Other Distribution : Rongbuk (Tibet) 5028 m., Everest Base Camp, Rongbuk Glacier.

*Throughout this paper the species marked with an asterisk are endemites.

ODONATA

Though our knowledge of this order occurring in the region is at present very incomplete, there seems to be little doubt that the dragonflies are unimportant minor elements in the nival insect fauna of the north-west Himalaya. As may be expected, endemism is rather very low. All the known species seem to be localized in the drainage areas of Jhelum and Chenab-Beas. Outside the NW. Himalaya, they are widely distributed in the Holarctic Realm (Fig. 4). As explained in our paper on the field ecology of the nival insects (100), the specializations of the Odonata do not seem to harmonize with the general ecologic conditions in the biome of the montane tundra of the NW. Himalaya.

Coenagriidae

1. *Enallagma cyathigerum* Charp.

Localities : Kashmir 3000 m.

Other Distribution : Central Asia, Tibet, Europe, N. America.

Libellulidae

2. *Libellula quadrimaculata* Linn.

Localities : Yusimarg 3040 m., Gulmarg.

Other Distribution : Lahsa, Europe, Central and N. Asia, Japan, N. America.

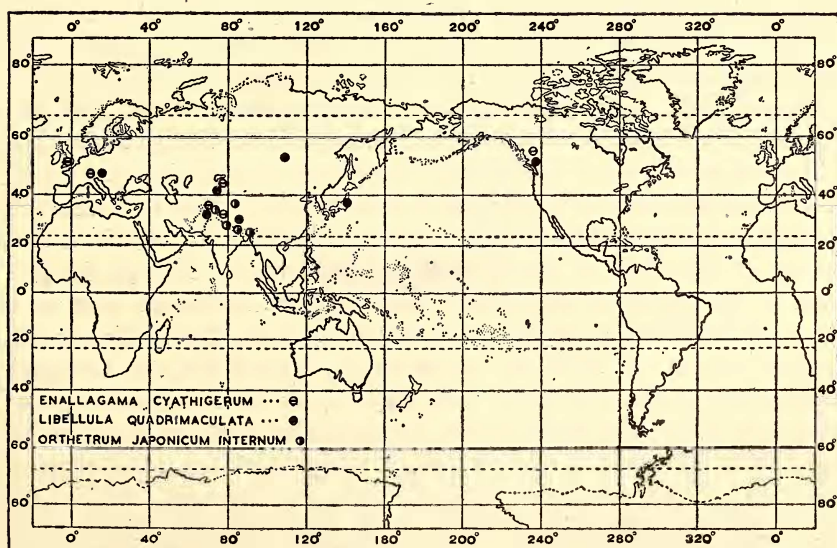


Fig. 4. The world distribution of the non-endemic nival Odonata from the north-west Himalaya.

3. *Orthetrum japonicum internum* MacLach.

Localities : Kashmir 3000 m.

Other Distribution : The Himalayan districts of Bengal, Nepal, Tibet, SW China, Assam.

*4. *Sympatrum tandicola* Santokh

Localities : Upper Chenab Valley near Tandi 3352 m.

ORTHOPTERA

This order constitutes about 3.3% of the total nival insect fauna (Table I, fig. 3) and comprises mostly Acrididae. Nearly 71% of the species are endemic. The Palaearctic elements constitute about 85.5% (Table X). There are several Mediterranean forms like *Sphingonotus* and *Oedipoda*. The central Asian elements are represented by four species of *Gomphomastax*, a genus which Uvarov (151) believes to have derived from ancient tropical and subtropical Eumastacinae. *Sphingonotus rubescens* (Walk.) (Fig. 5) is also known from Pamir, Persia, Baluchistan, Arabia, Palestine, Egypt, Lebanon, Sahara, Greece, Sardinia, and Canary Islands. Outside the NW. Himalaya, *Sphingonotus savingnyi* Sauss. (Fig. 5) occurs also in Sind and N. Africa. The genus *Sphingonotus* does not seem to inhabit very high elevations. *Metrioptera* is also common in Pamir, Alai, and other Turkestan mountains. *Bryodema luctuosa* (Stoll.) is an endemic species, but the genus *Bryodema* is known from Mongol-Tibetan border mountains and represents the Manchurian or the east-Asian South Palaearctic component of the nival insects of the region. *Conophyma mitchelli* Uvarov is an extremely interesting endemite. The genus *Conophyma* is also a central Asian form, with 13 species from Pamir (106) and other neighbouring Turkestan mountains (Fig. 6). Two other endemic species, *Dicranophyma hingstoni* Uvarov and *D. babaulti* Uvarov, also often occur near the timber line on the north slopes of the Great Himalaya in the Nanga Parbat area and seem to represent ecologically transitional forms. It must be observed that the genus *Dicranophyma* is itself endemic. The Indo-Malayan element is represented by *Aularches punctatus* (Drury) (Fig. 5), which often occurs at elevations of nearly 4800 m. above m.s.l. Though the great bulk of the species of Orthoptera from the NW. Himalaya seem to be generally localized at elevations of about 3500 m., the maximum altitudinal record of 5000 m. above m.s.l. is reached by the Tettigoniid *Hyphinomus fasciata* Uvarov. The majority of the Palaearctic species, especially the central Asian forms, are generally localized north of the main crest line of the Great Himalaya Range and the Mediterranean forms are similarly mostly localized in areas to the south of this crest line. The zoogeography of some of the more common high altitude Orthoptera from the NW. Himalaya has recently been discussed by Uvarov in a series of short papers (146-157).

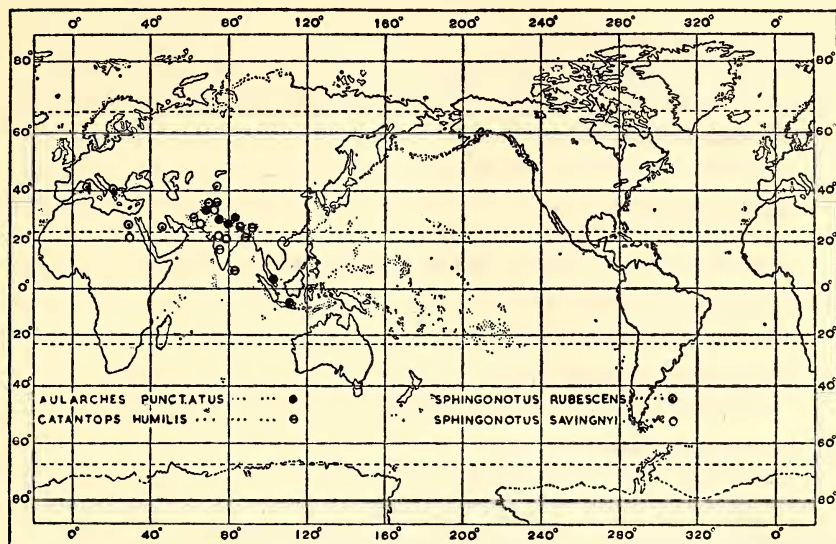


Fig. 5. The world distribution of the non-endemic nival Orthoptera from the north-west Himalaya.

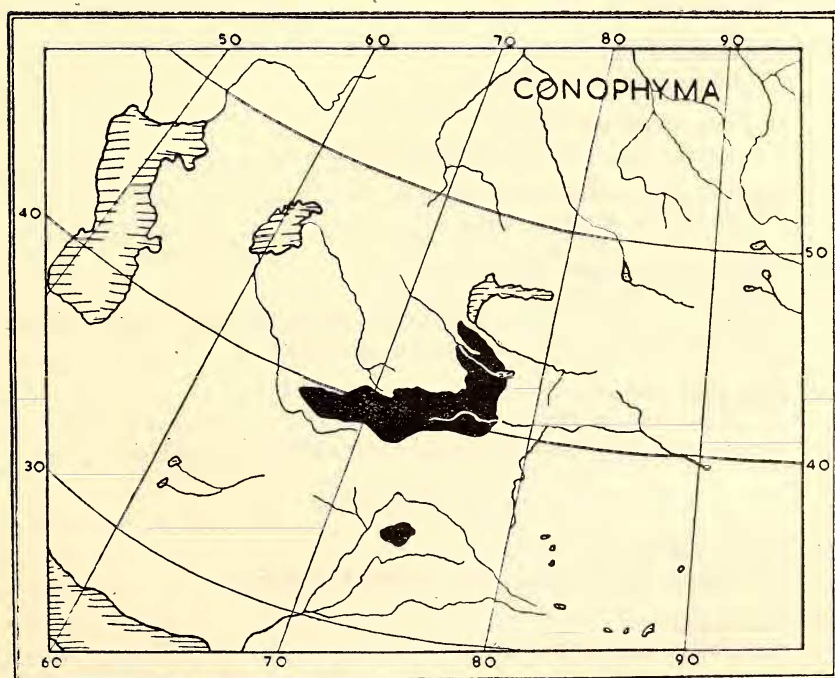


Fig. 6. The area of endemism (shaded black) of *Conophyma*, comprising central Asia and the north-west Himalaya.

Acrididae

1. *Aularches punctatus* (Drury)
Localities : Kashmir, about 3000 m.
Other Distribution : Tibet, Nepal, Garhwal, Malaya, Java.
- *2. *Bryodema luctuosa* (Stoll.)¹
Localities : Tso-Morari 4520 m.
3. *Catantops humilis* (Serville)
Localities : Spiti, Gharry, about 300 m.
Other Distribution : Sikkim, Assam, Calcutta, Bombay, Ceylon.
- *4. *Conophyma mitchelli* Uvarov
Localities : Srinagar 3350-3960 m.
- *5. *Dicranophyma hingstoni* Uvarov
Localities : Astor District about 3000 m.
- *6. *Dicranophyma babaulti* Uvarov
Localities : Gond about 3000 m.
- *7. *Gomphomastax bolivari* Uvarov
Localities : Tragbal Pass 3200 m.
- *8. *Gomphomastax antennatus* Brunner
Localities : Tragbal Pass 3200 m.
- *9. *Gomphomastax disparilis* Uvarov
Localities : Tragbal Pass 3200 m.
- *10. *Gomphomastax* sp.
Localities : Tso-Morari 4540 m.
- *11. *Oedipoda himalayana* Uvarov
Localities : Doyan 2440 m., Mulbek 4420 m.
- *12. *Spathosternum prasiniferum* (Walker)
Localities : Tragbal Pass 3200 m.
13. *Sphingonotus rubescens* (Walker)
Localities : Leh, 3440 m.
Other Distribution : Baluchistan, Arabia, Persia, Palestine, Lebanon, Egypt, Sahara, Greece, Sardinia, Canary Is., and Pamir.
14. *Sphingonotus savingnyi* Sauss.
Localities : Ladakh 3500 m.
Other Distribution : Sind, central and western India, North Africa.

Tettigonidae

- *15. *Hyphinomus fasciata* Uvarov
Localities : Dakar (Ladakh-Tibet border) 4572-4876 m.
- *16. *Metrioptera* sp.
Localities : Tragbal Pass 3200 m.

¹*Bryodema inda* Sauss. is recorded from Dakar on Tibet border. We have not seen specimens of this species and, in the absence of fuller data, we are not including this species here.

DERMAPTERA

This order is represented by three species of the typically Palaearctic genus *Anechura*, belonging to the mountain-inhabiting Anechurinae. The genus *Anechura* occurs in N. and central Asia and Europe. *Anechura zubovskii* Sem. occurs north of the main crest line of the Great Himalaya in the area drained by River Indus and the remaining two species seem to be localized in the areas south of the crest line in the Chenab-Beas drainage slopes. According to Burr (17), *Anechura zubovskii* Sem. is a local subspecies of *Anechura bipunctata* Sem., the typical form of which is known from Pyrenees, Alps, and the Balkan Mountains. In Crimea, Persia, and the Caucasus the subspecies *orientalis* seems to be common, *Anechura zubovskii* Sem. is also known from western parts of Tibet.

Forficulidae

* 1. *Anechura bipunctata pirpunjalae* Santokh

Localities : Khoksar 3657 m., Marhi 3657 m., Kulti Nal 3530 m., Hamta Jot 4440 m.

* 2. *Anechura himalayana* Santokh

Localities : Khoksar 3657 m., Marhi 3657 m., Rahla 2745 m.

* 3. *Anechura zubovskii* Semenov

Localities : Ladakh, Kashmir, 3500 m., road from Srinagar to Gilgit.

HETEROPTERA

This order constitutes about 4.5% of the total nival insect fauna of the region (Table I, fig. 5) and comprises mostly Lygaeidae. The species endemism amounts to nearly 65% and there are also two endemic genera *Dolmacoris* Hutchinson and *Tibetocoris* Hutchinson. The Palaearctic elements constitute nearly 94% and are largely represented by central Asian and North Palaearctic forms (Table X). *Bianchiella adelungi* Reut. represents the Manchurian element of the nival Heteroptera from the region. *Lamprodema brevicollis* Fieb., known from Dalmatia (Europe), appears to contribute the Mediterranean element (Fig. 7). The distribution of *Microplax hissarensis* Kiritsch. is shown in Fig. 7. *Nysius ericae* (Schill.), found commonly in the high elevations of the NW. Himalaya, is also known to occur in Pamir, Alai mountains, Astrakhan, Turkestan mountains, Taurus mountains, central Russia, Algeria, mountains of Yugoslavia, Rumania, Hungary, Austria, Switzerland, Belgium, and Germany (Fig. 8). The genus *Nysius* is widely distributed (Fig. 9) in Pamir and other Turkestan mountains, central Asiatic mountains, Mongolia, Japan, Mt. Everest area of the Himalaya, Greenland, Alaska, Egypt, Caucasus, Alps, Pyrenees, Syria, Canary Islands, Germany, France, Belgium, Holland, Hungary, Lapland, and Leningrad area.

The pentatomid *Phimodera rupshuensis* Hutchinson, occurring at an elevation of 4520 m. above m.s.l., is an interesting endemic. The genus *Phimodera* is widely distributed (Fig. 10) in central and N. Asia and in Europe. *Chlamydatus pachycerus* Kiritsch. is an interesting species which has been reported from the Mt. Everest area in the E. Himalaya. The genus is distributed (Fig. 11) in Caucasus, Siberia, Mongolia, Alaska, Greenland, Canada, Europe, and Algeria. The only Indo-Malayan form is the apterous Aradidae *Brachyrhynchus tagalicus* (Stoll.), confined to the birch-juniper zone at the edge of the taiga on the Pir Panjal Range, in the area drained by Chenab-Beas system. This species is ecologically and geographically a transitional form.

Four of the species are confined to an elevation of 3500 m. above m.s.l. and five each above 4000 m. and 5000 m. *Nysius ericae* (Schill.) occurs from an elevation of 3500 m. to nearly 5200 m. and *Nysius ericae alticola* Hutchinson occurs as high as 5365 m., which at present represents the maximum altitude record for Heteroptera in the NW. Himalaya.

Nearly 94% of the known species are localized in the area drained by River Indus, north of the crest line of the Great Himalaya.

Some of the peculiarities of the distribution of the high altitude Heteroptera from the NW. Himalaya and the neighbouring regions are discussed by Hutchinson (74), Oshanin (114), Kiritschenko (78, 79), and Reinig (123).

Pentatomidae

*1. *Phimodera rupshuensis* Hutchinson

Localities : Peldo la near north end of Tso-Morari 4520 m.

Coreidae

*2. *Stictopleura* sp.

Localities: Tsak-Shang and Tsak-ra, road from Tso-Morari to Tso-Kar 4570 m.

Lygaeidae

3. *Bianchiella adelungi* Reuter

Localities : Igu in the Indus Valley above Leh, 3400 m.

Other Distribution : North China, Mongolia, Siberia.

*4. *Dolmacoris deterrana* Hutchinson

Localities : Nyin-gri and Chungang La, 5120-5180 m.

*5. *Emblethis horvathiana* Hutchinson

Localities : Renka-la 5580 m., between Mitpal-Tso and Yaye Tso.

*6. *Lamprodema brevicollis* Fieb.

Localities : Tanktze to Chagra, Pongong Valley 4270 m., Ladakh.

Other Distribution : Dalmatia (Europe).

7. *Nysius ericae* (Schill.)

Localities : Leh 3440 m., Tsak-shang north of Tso-Morari 4570 m., Kayam La 4880 m., Koh Lungpa Valley 4880 m., Renka La between Mitpal Tso and Naye Tso 5180 m., and Ororotse Tso.

Other Distribution : Central Asia, Pamir.

*8. *Nysius ericae alticola* Hutchinson

Localities : Ororotse Tso 5280 m., Kyang La 5000-5300 m.

9. *Microplax hissarensis* Kiritschenko

Localities : Between Tsak-shang and Tsak-ra, road from Mitpal Tso to Tso Kar 4572 m.

Other Distribution : North Bukhara.

A r a d i d a e

10. *Brachyrhynchus tagalicus* (Stoll.)

Localities : Pir Panjal Range, Chandra Valley near Gramphu 3657 m.

Other Distribution : Burma, Java, Philippines.

A n t h o c o r i d a e

*11. *Anthocoris gyalpo* Hutchinson

Localities : Leh 3500 m.

*12. *Ectemnus paradoxus* Hutchinson

Localities : Igu in Indus Valley above Leh 3500 m.

M i r i d a e

*13. *Chlamydatus pachycerus* Kiritschenko

Localities : Shakya La 5180 m., Kyang La 5120-5330 m., Ororotse Tso 5300 m. Marsimik La 5300 m., Kyam La 4730 m., Nyangtzu 4660 m., Paldo La north of Tso Morari 4520 m., Tsak-Shang.

Other Distribution : Southern Tibet ; Mt. Everest area Eastern Himalaya 4110-5030 m.

*14. *Dicyphus physochlaenae* Hutchinson

Localities : Damb Guru 4620 m.

15. *Dicyphus senggae* Hutchinson

Localities : Between Tankse and Mugleb 4175 m.

*16. *Tibetocoris margaretae* Hutchinson

Localities : Chang Chenmo near Pamzal 5180-5270 m., Nying-ri 5120 m., Chungang La 5300 m., Kakstet La 5365 m.

S a l d i d a e

*17. *Chiloxanthus alticola* Kiritschenko

Localities : Bulaki-Murghai between Depsang and Tshangtsha, Shyok 4255 m.

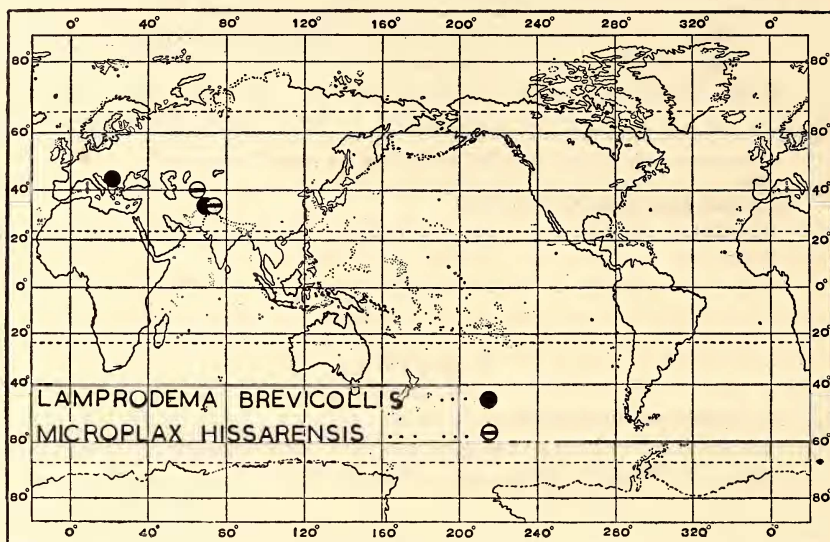


Fig. 7. The world distribution of two non-endemic nival species of Heteroptera from the north-west Himalaya.

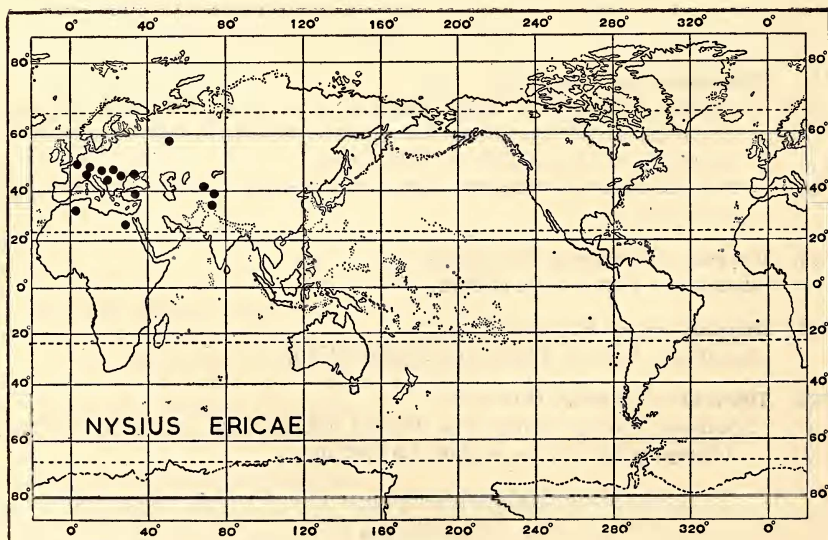


Fig. 8. The world distribution of *Nysius ericae* (Schill.)

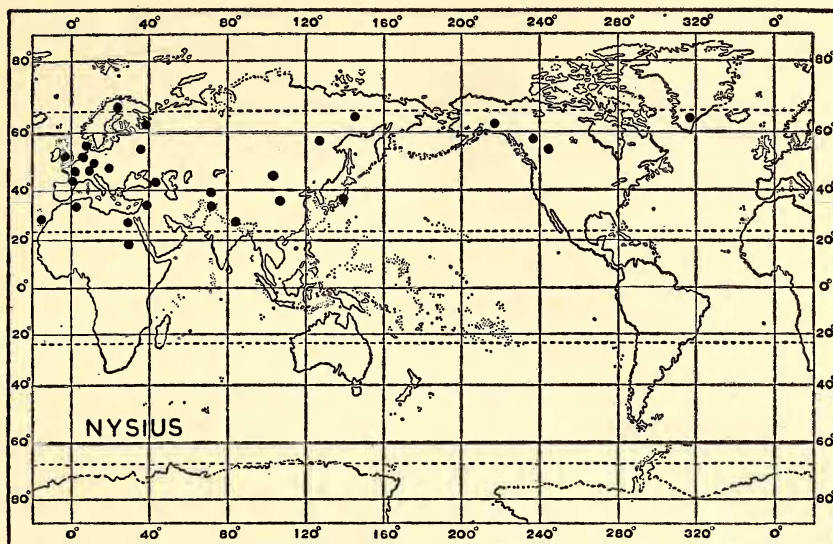


Fig. 9. The world distribution of the genus *Nysius*.

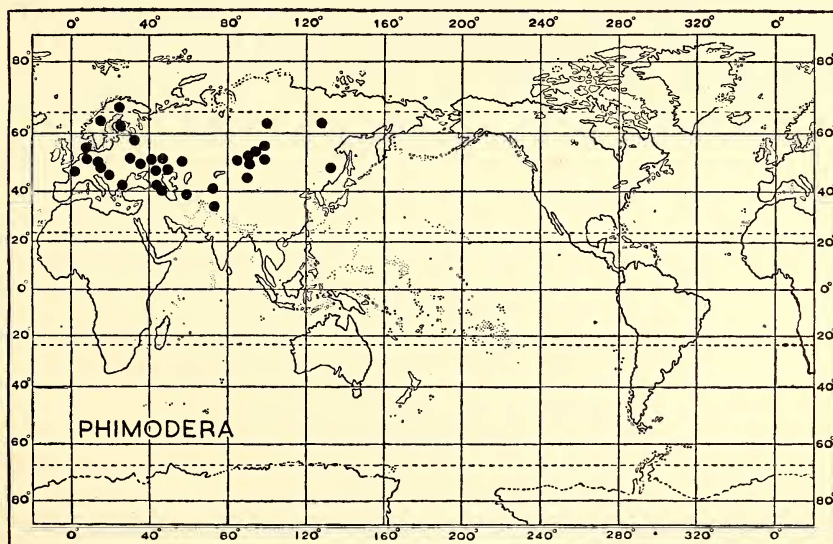


Fig. 10. The world distribution of the genus *Phimodera*.

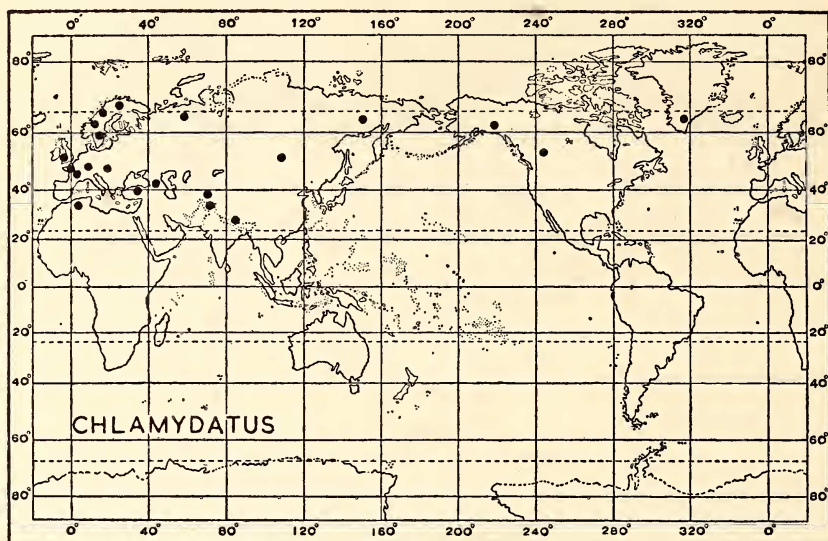


Fig. 11. The world distribution of the genus *Chlamydatus*.

HOMOPTERA

This order is represented by *Poophilus costalis* (Walk.) (Cercopidae). It is a widely distributed species found in other parts of Himalaya, Calcutta, Bombay, Karachi, Ceylon, Singapore, S. and W. Africa. In the NW. Himalaya the species has been collected from Dras 3100 m., Kargil 2740 m., and Leh 3440 m.

(To be continued)